CLAIMS

We claim:

1. A method for forming a connector including a plurality of contact elements, the method comprising:

providing a substrate;

forming a support layer on the substrate;

patterning the support layer to define a plurality support elements;

isotropically etching the plurality of support elements to form rounded corners on the top of each support element;

forming a metal layer on the substrate and on the plurality of support elements;

patterning the metal layer to define a plurality of contact elements, wherein each contact element includes a first metal portion on the substrate and a second metal portion extending from the first metal portion and partially across the top of a respective support element;

removing the plurality of support elements,

wherein the plurality of contact elements thus formed each includes a base portion attached to the substrate and a curved spring portion extending from the base portion and having a distal end projecting above the substrate, the curved spring portion being formed to have a concave curvature with respect to the surface of the substrate.

2. The method of claim 1, wherein forming a support layer on the substrate comprises:

depositing a layer of dielectric material.

3. The method of claim 2, wherein the dielectric material comprises a spin on glass layer, a TEOS layer, or a PCVD oxide layer.

4. The method of claim 1, wherein patterning the support layer to define a plurality of support elements comprises:

forming a mask layer over the support layer;

patterning the mask layer to define locations for the plurality of support elements;

anisotropically etching the support layer using the patterned mask layer; and

removing the patterned mask layer.

5. The method of claim 2, wherein isotropically etching the plurality of support elements comprises:

plasma etching the plurality of support elements using an etch chemistry capable of etching the dielectric material.

6. The method of claim 2, wherein isotropically etching the plurality of support elements comprises:

wet etching the plurality of support elements using an etchant capable of etching the dielectric material.

7. The method of claim 1, wherein forming a metal layer on the substrate comprises:

depositing a metal layer on the substrate.

8. The method of claim 7, wherein the depositing uses a chemical vapor deposition process, a physical vapor deposition process, an electro plating process, or a sputtering process.

9. The method of claim 1, wherein patterning the metal layer to define a plurality of contact elements comprises:

forming a mask layer over the metal layer;

patterning the mask layer to define locations for the plurality of contact elements;

etching the metal layer using the patterned mask layer; and

removing the patterned mask layer.

10. The method of claim 1, wherein removing the plurality of support elements comprises:

wet etching to remove the plurality of support elements.

11. The method of claim 1, wherein the curved spring portion of each contact element is formed to curve away from a plane of contact and having a curvature disposed to provide a controlled wiping action when the contact element engages a respective pad of a semiconductor device.

12. The method of claim 1, wherein the act of patterning the metal layer to define a plurality of contact elements comprises:

defining a first contact element including a first metal portion on the substrate and a second metal portion extending in a spiral configuration from the first metal portion and partially across the top of a respective support element.

13. The method of claim 1, wherein the patterning the metal layer to define a plurality of contact elements comprises:

defining a first contact element including a first metal portion on the substrate and proximate to a first end of a first support element and a second metal portion extending from the first metal portion and partially across the top of the first support element; and

defining a second contact element including a first metal portion on the substrate and proximate to a second end of a second support element, the second end opposite the first end, and a second metal portion extending from the first metal portion and partially across the top of the second support element,

wherein the first contact element and the second contact element thus formed have respective distal ends facing each other.

14. The method of claim 1, wherein the patterning the metal layer to define a plurality of contact elements comprises:

defining a first contact element including a first metal portion on the substrate and proximate to a first end of a first support element and a second metal portion extending from the first metal portion and partially across the top of the first support element; and

defining a second contact element including a first metal portion on the substrate and proximate to a second end of a second support element, the second end proximate to the first end of the first support element, and a second metal portion extending from the first metal portion and partially across the top of the second support element,

wherein the first contact element and the second contact element thus formed have jointed base portions and have respective distal ends facing away from each other.

15. A method for forming a connector including a plurality of contact elements, the method comprising:

providing a substrate;

providing a conductive adhesion layer on the substrate;

forming a support layer on the conductive adhesion layer;

patterning the support layer to define a plurality support elements;

isotropically etching the plurality of support elements to form rounded corners on the top of each support element;

forming a metal layer on the conductive adhesion layer and on the plurality of support elements;

patterning the metal layer and the conductive adhesion layer to define a plurality of contact elements, wherein each contact element includes a first metal portion formed on a conductive adhesion portion and a second metal portion extending from the first metal portion and partially across the top of a respective support element; and

removing the plurality of support elements,

wherein the plurality of contact elements thus formed each includes a base portion attached to the conductive adhesion portion which is attached to the substrate and a curved spring portion extending from the base portion and having a distal end projecting above the substrate, the curved spring portion being formed to have a concave curvature with respect to the surface of the substrate.

16. The method of claim 15, wherein patterning the support layer to define a plurality of support elements comprises:

forming a mask layer over the support layer;

patterning the mask layer to define locations for the plurality of support elements;

anisotropically etching the support layer using the patterned mask layer, the anisotropically etching stopping on or in the conductive adhesion layer; and

removing the patterned mask layer.

17. The method of claim 15, wherein patterning the metal layer and the conductive adhesion layer to define a plurality of contact elements comprises:

forming a mask layer over the metal layer;

patterning the mask layer to define locations for the plurality of contact elements;

etching the metal layer using the patterned mask layer;

etching the conductive adhesion layer using the patterned mask layer and the plurality of support elements; and

removing the patterned mask layer.

18. The method of claim 15, wherein the support layer comprises a dielectric layer and isotropically etching the plurality of support elements comprises:

plasma etching the plurality of support elements using an etch chemistry capable of etching the dielectric material.

19. The method of claim 15, wherein the support layer comprises a dielectric layer and isotropically etching the plurality of support elements comprises:

wet etching the plurality of support elements using an etchant capable of etching the dielectric material.

20. The method of claim 15, wherein forming a metal layer on the substrate comprises:

depositing a metal layer on the substrate using a process selected from a chemical vapor deposition process, a physical vapor deposition process, an electro plating process, or a sputtering process.